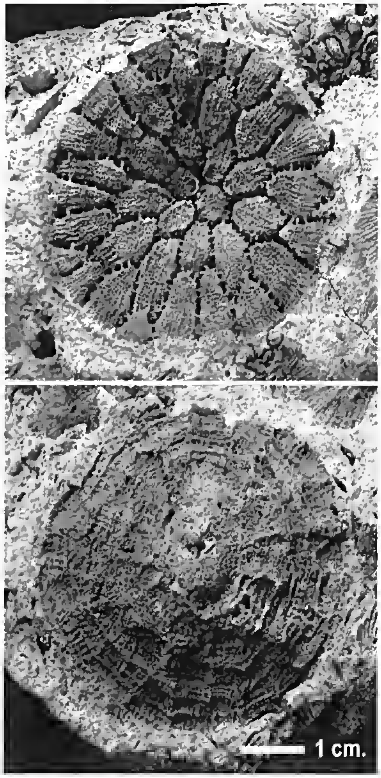
THE FOSSIL COLLECTOR

BULLETIN No. 81 SEPTEMBER 2007



"*Pleurodictyum*" *megastoma* McCoy (see article Page 21), Late Silurian Mt Ida Formation (Unit 1), Parish of Redcastle, Heathcote district, Victoria. Museum Victoria specimen MV P108715, originally figured by Neil, J. V., 1985, in *The Victorian Naturalist* 120(2), page 57, text-figs 1-3. Photograph, Frank Holmes.

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THE FOSSIL COLLECTORS' ASSOCIATION OF AUSTRALASIA

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CONTENTS

FUTURE OF THE F. C. A. A.

This issue, our eighty first, completes the three bulletins covered by the last annual subscription (July, 2006 – June, 2007). As you will see it includes three original articles (something we haven't been lucky enough to provide for many years) thanks to Clem Earp, Sarah Martin, and the late Jack Douglas. In addition we have a forth major article by Chris Goudey which we will publish in the next bulletin, as it is too long to include in this one.

Unfortunately, no one has come forward to take over or even assist with the running of the FCAA and, with one exception mentioned in the last bulletin, with the preparation of material ready for final editing and publication.

As advised in our letter dated 2 January, 2007, our Editor's personal and work commitments at the present time generally restrict his involvement to preparing the bulletin in a compact disk format for printing here in Melbourne.

This uncertainty about the future of *The Fossil Collector* has created a serious problem in determining if and when subscriptions should be renewed and in replying to requests from prospective new subscribers.

I have therefore decided with considerable regret, that unless <u>one or more of you</u> are prepared to take over the publication of *The Fossil Collector* and continue the existence of the FCAA, the next issue, Bulletin 82 (nominally January, 2008), will be the last.

While it is not a big task, no more than two people having been actively involved in the production and mailing of the bulletin over the last 27 years, it does require a degree of dedication to advancing the knowledge of palaeontology at an amateur level.

Anyone who would like a detailed run-down of the work involved can contact me by letter, telephone or email (see details page 2). If by some miracle we are able to continue, I will still be available to assist and advise for as long as I am in good health.

Frank Holmes, Secretary/Treasurer

FOUNDING MEMBER PASSES ON – DON CLARK R. I. P.

After 83 years of passion and struggle, one of the FCAA's founding members, Don Clark, was laid to rest in the Andamooka Opal Field's cemetery on August 15th, 2007. The simple ceremony was attended by about 80 people and then followed by a wake.

Don was born in Tasmania in 1924 and developed his rock collecting passion there collecting agates and Lune River tree fern fossils. His brother and his army mates restarted the South Aussie opal field in 1946 after the labour shortages of the war. Don followed his brother to Andamooka in the same year and apart from a couple of forays, always came back here. Now he won't ever leave again. He was a hard working man who had raised a big family of seven, was a tireless ambassador for Andamooka and a fanatical rock & fossil collector.

To achieve his successes with only his left arm was one of the reasons that Don was a legend in this part of the outback, although his fossil successes were not well known. Whilst looking for good specimens of Cambrian reef-building archaeocyathids, Don believed he had found the first complete radiocyatha specimen, thus solving an enigma. He also found a small opalised therapod dinosaur vertebra as well as two small opalised shells, that if not new species are new to South Aussie. Another species is still in the naming phase and is expected to carry Don's name when Drs Ben Kear & Bob Hamilton-Bruce manage to synchronize their efforts to achieve this outcome for his family, even if he cannot revel in it himself.

If a man who lost his right arm as a toddler can over come all odds with an oversized smile and unstoppable optimism, why can't we? Don's achievements included, digging Tassie agates in deep mud once the thickets were cleared, successfully and competitively racing pushbikes during WW2, playing competitive football, working with Commonwealth forces in Woomera post WW2, and driving trucks delivering self collected firewood and drums of potable water 200kg at a time. Don also did some opal mining, prospected for minerals and fossils, and even quarried ornamental dimension stone. Most winters were spent greeting and guiding tourists through Andamooka's historic cottages. As if that is not enough, Don used to cut and polish opal cabochons with only his left hand!

To all of you that knew him, next time you see or are involved in a toast, remember his favorite throw away line, "I've got lots of rocks, mostly in me head" and mentally or physically, have one for Don.

Tom & Sharon Hurley

PLANT IMPRESSIONS FROM CHIMNEY POT GAP, GRAMPIANS RANGES, VICTORIA.

by Jack Douglas

In "The Baragwanathia Story"(The Fossil Collector, Bulletin 77), a statement in Table 2 suggests that further observations on the older Palaeozoic floras of southern Australia might be forthcoming. This article re-examines very poorly preserved impressions I found fifty years ago in the Grampians Ranges (Geriwerd), Victoria.

Resumé.

Plant impressions from a locality [1] at Chimney Pot Gap, Grampians Ranges, western Victoria, are re-examined, and their relationship to the *Baragwanathia* Flora is assessed.

Introduction

The most ancient plant remains identified from south-eastern Australia appear to be thallophytes, principally **brown algae** (Phaeophyceae), (Lucas 1927, Tims 1980, Douglas 1981, Douglas & Jell 1985, etc). These thallophytes have been collected from Cambrian, Ordovician Silurian and Early Devonian sediments of the Lachlan Fold Belt.
Then, out of the blue, so as to speak , in Late Silurian sediments there suddenly appears the *Baragwanathia* flora, with its key species *B. longifolia,* a relatively **massive land plant** usually fossilized as clearly distinguishable stems with attached leaves.

Plant fossils found whilst assisting Don Spencer-Jones during geological surveying in the Grampians were described, under the name "Sphenopsida?", as "fragmentary stem remains up to 60 mm. long and 5mm. wide, with longitudinal ribs interrupted at irregular intervals by articulations which appear to be the points of origin of branches" (Douglas *in* Spencer-Jones, 1965). One specimen, G.S.V. number 57631, now Museum Victoria NMV P165781, was figured [2].

Much more recent geological surveying has brought into question the long accepted age of the Grampians sediments, and prompted this reassessment of the stems and their relationship to the *Baragwanathia* flora.

[1]. Fossil Site 12, Table 3, Cayley & Taylor 1997; Locality 10, Table 5, Spencer-Jones 1965. On some maps, e.g. Vicroads State Directory, Second Edition, Glenelg River Road is called Victoria Valley Road.
[2]. at a magnification x2, but not noted in caption.

The Chimney Pot Gap fossils are very **poorly preserved impressions** [3] in well-bedded, but friable fine-grained sandstone, where the fine quartz-grain matrix does not lend itself to clear definition of form.They are exposed for about two metres in a roadside drain, often veiled by storm-swept gravel and sand.

I have recently revisited the locality, and ten specimens have been allocated Museum of Victoria Numbers NMVP 227806 to 227815 [4], complementing specimen NMVP 165781 deposited many years ago. Collection is difficult because access to the exposure is limited by the gravelled road immediately up-dip, and heavy overlying sandstone in the cutting. Percolating drainage water has also rendered much of the fossil bed very friable.

The Sphenopsida? determination was influenced by the suggestion of Spencer-Jones (1965) that the Victoria Range Sandstones containing the fossils were deposited during the **Late Devonian to Early Carboniferous** Periods, which elsewhere, (including Victoria), contain primitive sphenopsids.

On the other hand Cayley & Taylor, 1997, in their major investigation on Grampians geology stated that "the geological history as presently understood demands that the Grampians Group be **Ordovician to Early Silurian in age**." They placed (p. 33) the Chimney Pot Gap locality [5] in the lowest part of the Serra Sandstone, and very close to where the Silverband Formation is overlain by Mount Difficult Subgroup sandstones.

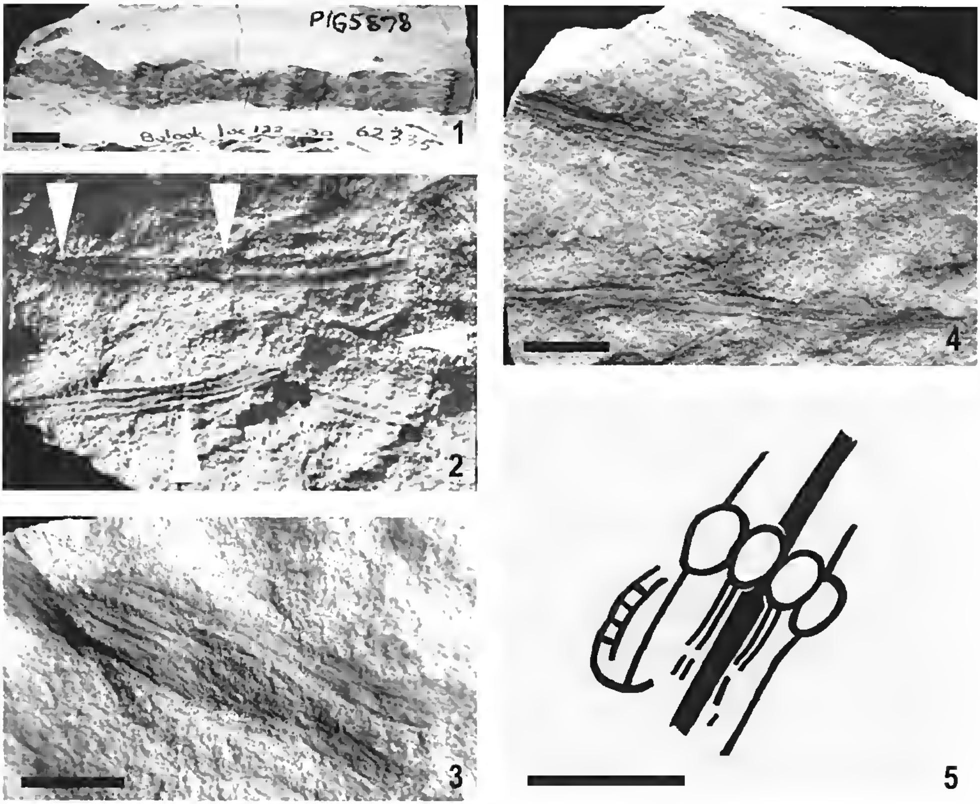
Turner (1993), working on the vertebrate fauna (mainly fish spines and scales), dated the Silverband Formation as **Late Silurian**. Even more recently Burrow (2003), also working on the fauna, suggested a ?late Ludlow (Silurian) age.

These age determinations place the Chimney Pot Gap locality considerably older than that accepted by Spencer-Jones, perhaps predating even the oldest recorded sphenopsids, and suggest that classification be reassessed.

[3]. also rarely as casts.
[4]. at the time of going to press, these numbered specimens have not been located (fch).
[5].They refer repeatedly to "Sphenopsid stems", rather than the "Sphenopsid?" title, unintentionally proceeding further along the line of acceptance of articulation!

Reassessment

Perceived relationship to the Sphenopsida was based on (quote)
"1. Long straight stem sections.
2. Articulation.
3. Longitudinal ribbing.
4. Apparent branching from articulation points,"



FIGURES. 1, Sphenopsid (*Equisetites* sp.) from the Early Cretaceous sediments, Balook, Victoria, showing node with sheathing leaves. This specimen (NMV P165878) shows the nodal structure of a sphenopsid in relatively well-preserved siltstone very much younger than the poorly preserved specimens from Chimney Pot Gap. **2**, Chimney Pot gap specimen showing striations, ribs, and perceived nodes. Arrows at top and bottom indicate possible nodes, while arrow at right indicates possible nodal structure. Scale and location of specimen unknown. **3 & 4**, typical Chimney Pot Gap specimens showing striations and ribs (note difference in thickness of stems in Fig.4). **5**, Diagram of perceived buds on specimen NMV P227806. Scale bars 10 mm.

Property 1. Long straight stem sections.
The fossils are mainly represented as straight stem sections. "Long" is a vague term; the largest specimen recorded having a length of 110 mm. Width varies considerably up to about 10 mm.
A few long, more string than ribbon-like specimens may represent a different species.
The fragments also tend to be aligned in one (current?) direction.

Property 2. Articulation.
There are numerous constrictions along the length of the stems and transverse bands and swellings which suggest articulation. However, these are not persistent or regularly spaced.
A short stem, length less than 20mm, width 4mm, appears to display oval bodies (see **Fig. 5)**, arranged in an arc across the stem at an articulation, much in the manner of equisetaceous Spenopsida of much younger geological age, but the structure is very obscure. Any claim of regular articulation is difficult to justify.

Property 3. Longitudinal ribbing
Longitudinal ribs form pronounced arched ribs in some specimens, and striae or longitudinal lines are common in others. No more than three arched ribs have been observed, but striae are up to 5 in number. A centre rib is sometimes prominent and may represent a main vein.

Property 4. Apparent branching.
This is best expressed as "apparent branching, shoot or leaflet occurrence."
Again the overlapping and fragmentary nature of the specimens makes this difficult to ascertain." Oval bodies mentioned above, (Property 2), may represent buds, or branches in this context.

Strap like stems have been recorded from several *Baragwanathia* assemblages. Zosterophyllaceae sp A from Barclays Cutting Yea, and also Turtons Creek (Douglas & Holmes, loc.cit.) is similar in size, and perhaps in bud shape, but does not possess striking striation or ribbing, or any suggestion of articulation

This reassessment has not resulted in any identification more specific than the 1965 suggestion, and I recommend retaining the original label, "Sphenopsida?"

Cayley and Taylor interpreted the sandstone members of the Silverband Formation as representing episodes of invasive deltaic to fluvial sedimentation, and noted that Jenkins (1989) interpreted the lower parts of the Serra Sandstone in another area, the Wonderland Range, as fluvial braid plain deposits.

The **oldest** members of the *Baragwanathia* Flora have been dated, (Garratt & Rickards 1984), as Late Silurian (Ludlow) in age. Following the age suggestions of Turner (1993), and Burrow (2003), and in view of the environment suggested above, the Chimney Pot Gap stems may well be a previously unsighted member of this assemblage.

Postscript.

Searching in the Grampians for additional outcrop of the plant bed, initially along strike at Chimney pot Gap, and later at other likely spots indicated by the Cayley & Taylor maps, should be an enjoyable exercise for the fossil collector. The discovery of new sites could considerably advance our understanding of the ancient environment, biota and geological age.

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ECHINOIDS GALORE

by Jeff Tonkin

On a recent weekly Tuesday dig, my friend Bill and I visited a friend's property at Younghusband on the Murray River to search for fossils. This area is a known fossil bed, how rich we were soon to find out.

The property has a huge valley with about 12 gullies running off to the left and right. On arriving we decided to try our luck in a gully by the hay shed and to our surprise soon started to find plenty of fossils just lying on top of the ground, having been washed out by the 3 inches (75 mm) of rain the previous week. The majority were *Lovenia forbesii*, but larger than the ones usually found in other sites. Encouraged by this, our heightened efforts soon paid dividends when Bill found a nice *Amoraster tuberculata* specimen sitting there waiting for someone to pick up. It was a nice size about 7.5 x 5 cm and was completely undamaged and clean. Not 10 metres further up the gully there were two large *Eupatagus rotundus* specimens just lying on the sand which a fox had dug out of its burrow. Forever grateful, I thanked the fox and treated Bill to the normal response – Ars*////////*. After lunch we decided to try our luck in a small area which had been turned over by a ripper and were pleasantly surprised to find many more echinoids. These were exposed in a section about 10 x 4 metres where a ramp was being formed. We found several large and fairly clean specimens of *Corystus dysasteroides* sitting in the loose soil and stone.

The following Tuesday we were back digging like rabbits and finding many more echinoids, pectans, and other shells. This area has to date yielded numerous species of echinoids, including *Amoraster tuberculata, Corystus dysasteroides, Eupatagus cetus, E. collabus, E. murrayensis, E. rotundus, Fibularia gregata, Lovenia forbesii, Monostychia australis,* and ?*Scutellinoides patella*.

The valley has another kilometre of cliffs and gullies to explore, so at our present rate we should be searching the area for at least another two more winters, as in the warmer months it is alive with snakes.

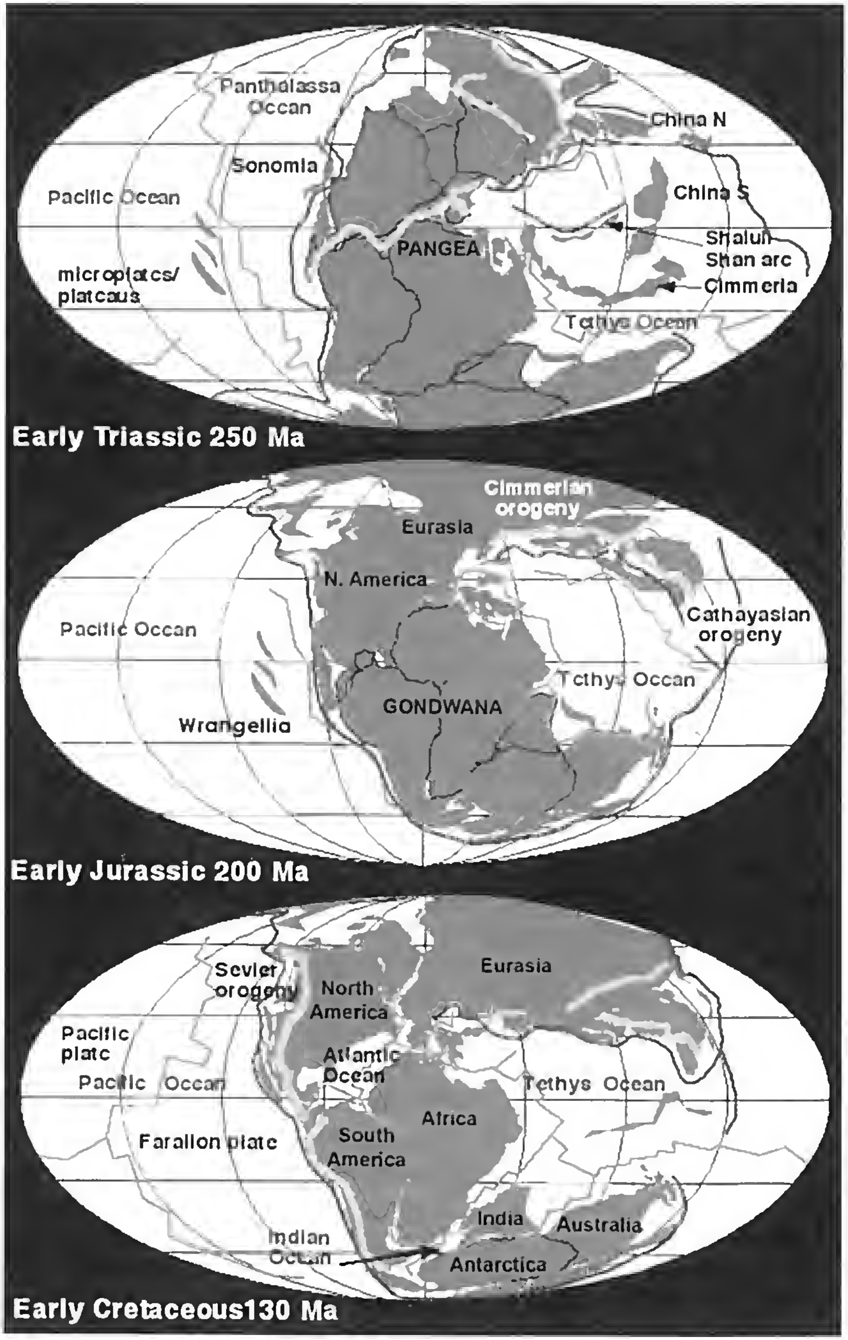
Who knows what we will find next in this treasure trove of fossils?

STANDING ON THE SHOULDERS OF GIANTS: AUSTRALIAN FOSSIL INSECTS FROM THE AGE OF THE DINOSAURS

Article based on a talk given to the Field Naturalists Club of Victoria (Geology Group) by **Sarah Martin**, PhD. Student, Monash University, Melbourne.

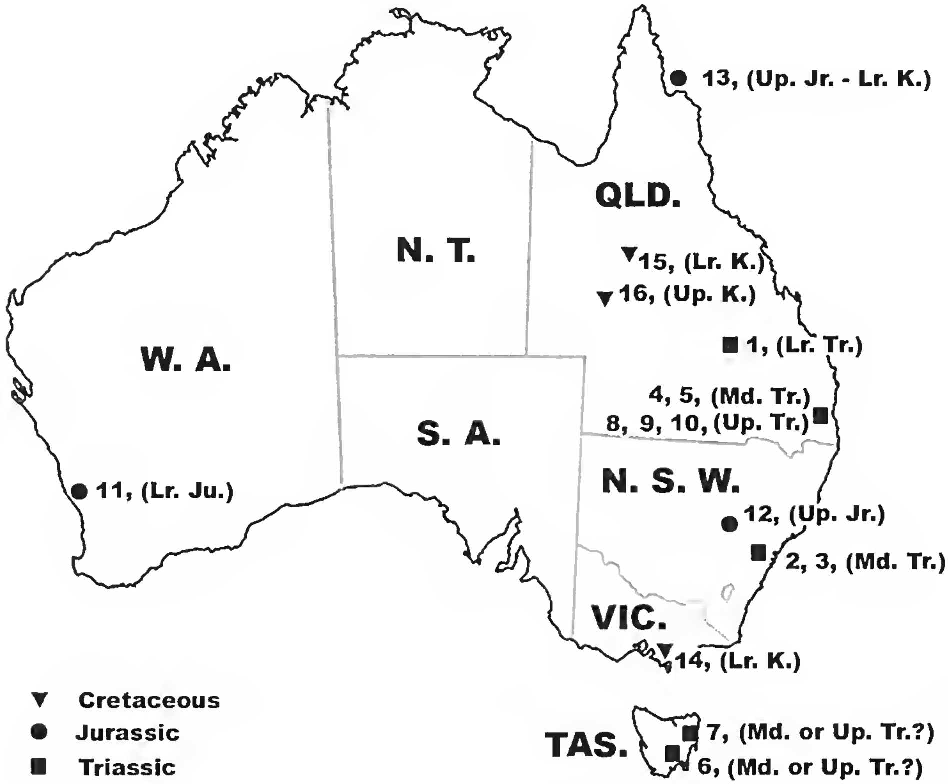
Although the most common perception is that insects are rare in the fossil record, the opposite is actually the case. In fact more insects have been described than four limbed vertebrate animals (tetrapods) such as amphibians, reptiles, birds and mammals. However, while much is known and understood about the fossil insect deposits of the northern hemisphere, the southern hemisphere deposits, including those from Australia, have not been well studied. Even though the first report of a fossil insect found in Australia was made by Charles Moore in 1870 (see footnote), the understanding of fossil insects on this continent has been hampered by the lack of dedicated workers in the field; with much of what is currently known in desperate need of updating and reassessment (Jell 2004). In the last century most of the work on fossil faunas was carried out by active entomologists such as R. J. Tillyard (from 1915-1937) and E. F. Riek (from 1950-1970). The most recent work of significance is that of P. A. Jell & P. M. Duncan (1986), who described the Early Cretaceous insects from the Koonwarra Fossil Beds of Victoria.

Despite these problems, 21 insect-bearing fossil localities are known from Australia; 16 of these coming from the period of geological time commonly known as the “Age of the Dinosaurs” (Jell 2004). Geologists refer to this as the Mesozoic, the era which extends from 251 to 66 million years ago. The Mesozoic is divided into three periods – the Triassic (251-200 mya), Jurassic (200-145 mya), and Cretaceous (145-66 mya) – each preserving a distinctive insect fauna. Most of the Australian information relates to the Middle and Late Triassic insects, with 9 separate sites known from across eastern Australia, particularly southeastern Queensland. Although one Early Triassic locality is also recorded, not much is known about the insects of this site; the same is true of the two Jurassic insect body-fossil sites, although research has begun on both localities. Cretaceous insect localities are also uncommon, although, as mentioned above, one site (Koonwarra) has



MESOZOIC PALAEOGEOGRAPHICAL MAPS

been monographed, with two other sites requiring more comprehensive exploration (Jell 2004).



1. Lower Triassic Arcadia Formation, Bowen Basin, Queensland.
2. Middle Triassic (Anisian) Hawkesbury Sandstone, Brookvale Quarry, Sydney Basin, New South Wales.
3. Middle Triassic (late Anisian) Ashfield Shale, St. Peter's locality, Cumberland, Sydney Basin, New South Wales.
4. Middle Triassic (Anisian) Esk Formation, Esk Trough, Queensland.
5. Middle Triassic (Anisian) Gayndah Formation, Esk Trough, Queensland.
6. Middle or Upper Triassic (?) New Town Coal Measures, Tasmania.
7. Middle or Upper Triassic (?) Mt. Nicholas Coal Measures, Tasmania.
8. Upper Triassic (Rhaetian) Aberdare Formation, Clarence-Morton Basin, Queensland.
9. Upper Triassic (Carnian) Mt. Crosby Formation, Ipswich Coal Measures, Ipswich Basin, Queensland.

10. Upper Triassic (late Carnian) Blackstone Formation, Denmark Hill locality, Ipswich Coal Measures, Ipswich Basin, Queensland.
11. Lower Jurassic (Pliensbachian-Aalenian) Cattamarra Coal Measures, Mintaja insect locality, Perth Basin, Western Australia.
12. Upper Jurassic (Kimmeridgian) Purlawaugh Formation, Talbragar Fish Bed, New South Wales.
13. Uppermost Jurassic/Lowermost Cretaceous Gilbert River Formation (was Battle Camp Formation), Laura-Lakefield Basin, Queensland (trace fossils only).
14. Lower Cretaceous (Aptian-Albian) Eumerella Group, Koonwarra Fossil Bed, Gippsland Basin, Victoria.
15. Lower Cretaceous (Barremian-Albian) Wallumbilla Formation, Eromanga Basin, western Queensland.
16. Upper Cretaceous (Albian-Cenomanian) Winton Formation, Eromanga Basin, western Queensland.

The Mesozoic is important as the period in which the modern insect fauna appeared and evolved. The extinct groups of insects common at the end of the Palaeozoic (545-251 mya) - such as the giant dragonflies (e.g. *Meganeura*) - were hard hit by the mass extinction event that marks the beginning of the Mesozoic. This event acted to "clear the decks" of these old groups, allowing the evolution of new orders such as the butterflies, flies, termites, bees and ants, and the diversification of groups that were previously unimportant, such as the now ubiquitous beetles. As a result, the Australian fossil insect fauna, like those preserved elsewhere in the world, becomes increasingly "modern" throughout the Mesozoic, with lower proportions of extinct groups and higher proportions of extant groups present in the Cretaceous when compared to the Triassic (Grimaldi & Engel 2005). Despite this overall trend, different groups appear to have modernised at different rates. For example, in the Early Cretaceous (~115 million year old) Koonwarra Fossil Bed fauna of Victoria, the cockroaches belong to an extinct family, taxonomically and morphologically unlike modern cockroaches, while water-striders from the same locality are very similar to extant species seen in Australia today (pers. obs.).

A number of important extant insect groups appear in the Australian fossil record during the Mesozoic era. Although cockroaches are recorded in the Northern Hemisphere from a much earlier period (Late Carboniferous, ~300 million years ago), this important group is first preserved in Australia in the Middle Triassic (245-228 mya) (Tillyard 1916). This epoch also sees the first diversification of the beetles, which dominate all subsequent Australian fossil insect assemblages.

Also characteristic of these Middle Triassic localities are a strange group of insects, the titanopterans, which to date have only been recovered from Australia and Russia (Grimaldi & Engel 2005). Titanopterans are related to the grasshoppers and crickets, in fact they are thought to resemble giant predatory crickets and are one of the oldest insect groups known to have been able to "sing". Titanopterans had stridulatory surfaces on their fore wings which they would have rubbed together to produce sounds thought to have resembled songs made

PLATE ANNOTATION (pages 16 & 17)

Figure 1. Wing of the titanopteran *Clatrotitan scullyi* (Tillyard,1925), Middle Triassic Hawkesbury Sandstone, Sydney Basin, N.S.W. (locality 2). Specimen AM F36274, length 139 mm. Photograph adapted from Grimaldi & Engel (2005), p. 216, fig. 7.42.

Figure 2. Dorsal view of disarticulated insect head, Early Jurassic Mintaja insect site, Cattamarra Coal Measures, W.A. (locality 11). Specimen, Western Australian Museum Palaeontological collection. Photograph Sarah Martin.

Figure 3. Well preserved leaf with mine of larval moth, Eocene of Anglesea, Victoria. Specimen MV P180365 (length 64 mm). Photograph adapted from Grimaldi & Engel (2005), p. 52, fig. 2.20.

Figure 4. Lacewing *Petropsychops superba* Riek, 1956 (Osmylopsychopsidae), Late Triassic Blackstone Formation, Denmark Hill, Queensland (locality 9). Specimen UQC2135-6, length 29 mm). Photograph adapted from Grimaldi & Engel (2005), p. 344, fig. 9.15.

Figure 5. ,A close relative of true fleas, *Tarwinia australis* Jell & Duncan, 1986, Early Cretaceous Koonwarra Fossil Bed, Victoria (locality 14). Specimen MV P26202 (body length 7 mm). Photograph adapted from Grimaldi & Engel (2005), p. 487, fig. 12.19.

Figure 6. Dorsal viw of a well preserved fossil of the extinct family Protopsyllidiidae, thought to be elated to the modern plan pests Psyllidae (lerp insects), Late Jurassic Talbragar Fish Bed, N.S.W. (locality 12) Specimen AM F13740. Photograph Sarah Martin.

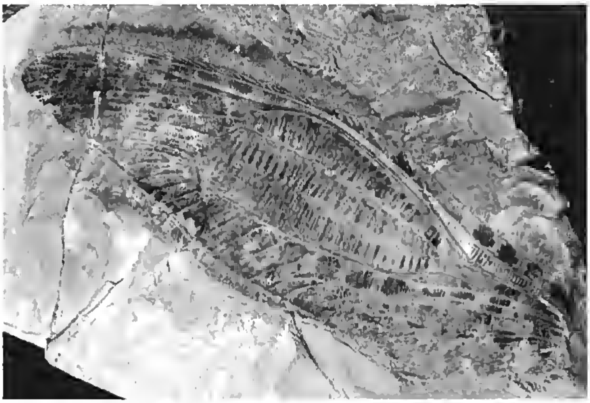
Figure 7. Interperative sketch of Figure 6 (Protopsyllidiidae) by Sarah Martin.

Figure 8. Immature cockroach (nymph) originally described by Jell & Duncan (1986) as the extant genus *Methara*, but probably belonging to an extinct family of cockroaches (?Mesoblattiniae), Early Cretaceous Koonwarra Fossil Bed, Victoria (locality 14). Specimen MV P102532. Photograph Sarah martin.

Figure 9. *Duncanovelia extensa* Jell & Duncan (1986), a water strider belonging to the extant family Mesoveliidae, Early Cretaceous Koonwarra Fossil Bed, Victoria (locality 14). Specimen MV P27044. Photograph Sarah Martin.

Figure 10. Partial dragonfly wing, *Peraphlebia tetrastichia* Jell & Duncan, 1986, Early Cretaceous Koonwarra Fossil Bed, Victoria (locality 14). Specimen MV P103204B. Photograph Sarah Martin.

Note: specimen number prefix AM F = Australian Museum, MV P = Museum Victoria and UQC = University of Queensland.



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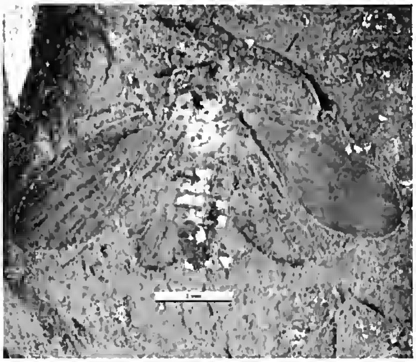

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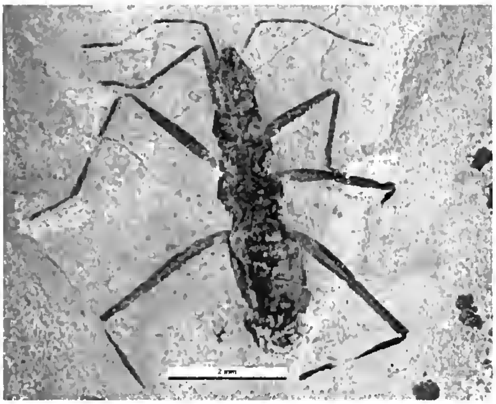

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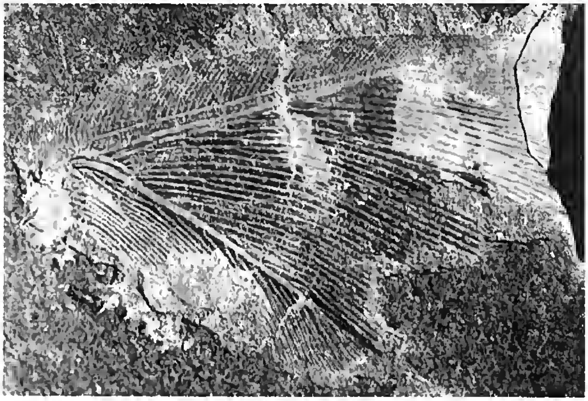
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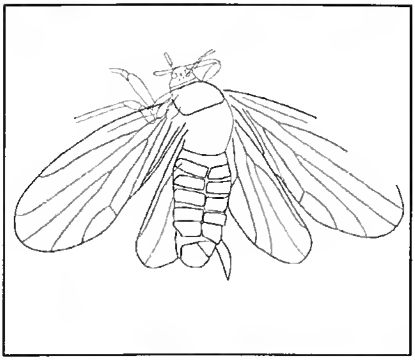
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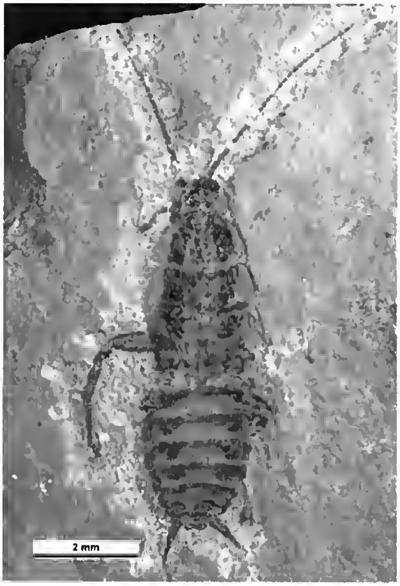

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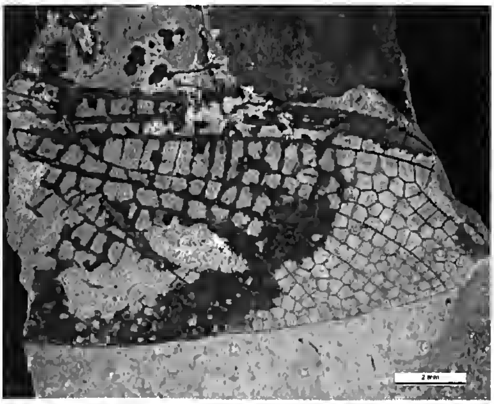
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by modern bullfrogs (Grimaldi & Engel 2005). One Australian representative of the Titanoptera had a wing-span of roughly 30cm (McKeown 1937)!

The Late Triassic (228-200 mya) fauna of Australia is world-class in diversity and numbers of specimens. As well as preserving a large range of the insects which would have lived at this time, these localities are also important in that they contain some of the world's earliest records of stick insects, aphids, and hymenopterans - in this case, xyelid sawflies, a group still living today (Grimaldi & Engel 2005) – as well as an early, diverse assemblage of true flies (Krzeminski & Krzeminska 2003). There are also the first Australian record of water bugs (similar to modern water boatman) and Australia's (and perhaps the world's) earliest true damselfly nymph (Jell 2004).

Jurassic insects are as yet undescribed from Australia, although work is continuing to understand this period of insect evolution (Beattie 2007). There is, however, an interesting set of trace fossils from northern Queensland – leaf mines which are considered to be the world's oldest traces of this type undoubtedly made by an insect (Zherikhin 2002). Researchers have noted that the traces resemble mines made today by nepticulid moth caterpillars (Rozefelds 1988); if so, this is the oldest record of the butterflies and moths in Australia.

The Early Cretaceous insect fauna is known in Australia from one fantastic locality, the Koonwarra Fossil Bed. This site, considered the preserved remains of an ancient lake, is unique in Australia in that most of the preserved insects were aquatic insects living in the water body, as opposed to terrestrial insects would have fallen into the lake. As a result, aquatic insects, such as mayfly, dragonfly, scorpion-fly, caddis-fly and true fly larvae, water striders, toad bugs and water beetles are common, although a wide range of cockroaches, terrestrial beetles, terrestrial bugs, and wasps also occur (Jell & Duncan 1986). All of these specimens are generally complete and exceptionally preserved, and as a result Koonwarra is considered among the world's most important Cretaceous insect deposits. Despite the rich array of insects found from Koonwarra, the locality's most famous specimen is *Tarwinia australis*, generally acknowledged as the world's oldest fossil flea. A number of features preserved on this specimen, including its mouthparts, flattened body shape, and distinctive combs on its legs (used to hold onto its host) indicate that like modern flea's, *Tarwinia*, wa

was an ectoparasite, probably on warm-blooded vertebrates. During the Late Jurassic and Early Cretaceous, parasitism and blood-sucking of vertebrate animals by insects was a newly evolved behaviour (Grimaldi & Engel 2005), and in addition to the flea, a number of flies which are probably occasional blood-drinkers are also known from Koonwarra, including a species of *Leptoconops*, a biting midge genus still extant in Australia. Unfortunately, no-one is certain which animal *Tarwinia* was a parasite of. Although fleas are considered to have adapted to parasitizing mammals and moved secondarily onto birds, some researchers compared *Tarwinia* and other early ectoparasites to modern bat parasites, and suggested on this basis that these parasites were living on pterosaurs (flying reptiles; bats didn't evolved until the Cainozoic) (Ponomarenko 1976). However, mammals, monotremes, birds, dinosaurs and pterosaurs were all present during the Early Cretaceous in southern Australia, and it is possible any one of these groups could have been *Tarwinia*'s host.

It can be seen, therefore, that despite being a relatively neglected part of the Australian fossil record, the Mesozoic insect fauna is both diverse and interesting, continually throwing up specimens and assemblages that allow us to interpret the origins and evolution of Australia's unique modern entomofauna.

FOOTNOTE

The first record of a fossil insect found in Australia was made in 1870 by Charles Moore, who reported on an insect from New South Wales (Moore 1870). Moore considered this specimen, a beetle elytron, to be Tertiary in age from a place called "Rocky River, Sydney Flats". I have no idea where this place is meant to be although one would assume it to be near Sydney. However, the only Rocky River I can find in NSW occurs near Armidale and I can't recall a later reference to this location in the literature. The specimen was given to Moore by a lady who was visiting Bath, so if the specimen still exists it's probably in a museum somewhere in England. As the age was based on the general form of leaves preserved in the sediment, it seems likely that a Cenozoic age is correct, but it is impossible to be any more specific. The next record of a fossil insect discovery was published by Woodward (1884). The specimen described, one of two dragonfly wings, was from the Lower Cretaceous Wallumbilla Formation, Queensland (see map locality 15). Both of these specimens can be found in Queensland – one in collections of the Queensland Geological Survey, the other in the University of Queensland's Geology Department collections.

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WHICH PLEURODICTIFORM CORAL?

by Clem Earp

One of the best-known and most easily collected fossils from the Siluro-Devonian of central Victoria is the tabulate coral *Pleurodictyum megastoma*. The moulds of its large corallum, filled with a honeycomb pattern of relatively large corallites, are easily recognizable in the Humevale Siltstone of the Kinglake district and in the sandstones at Mt Ida near Heathcote. Although it is a fossil that even the most inexperienced collector can identify, things may be about to change from the taxonomic standpoint.

First a bit of history. The coral was collected by government geologists exploring the wilds of the Yarra Valley just over 150 years ago. It sat around in the Geological Survey collections for 10 years or so until the palaeontologist Frederick McCoy started looking over the material. He immediately recognized it as similar to a European coral, no doubt the species *Pleurodictyum problematicum* (Fig. 1), but the corallites were much bigger. He accordingly named it *Pleurodictyum megastoma* ("big mouths"). This name appeared in print for the first time in pamphlets prepared for the Intercolonial Exhibition held in Melbourne from 23rd October 1866 to 9th February 1867. As it happened, the first pamphlet to appear was in French and the taxonomic name was mangled by the printers ("Pleurodicityon megostoma"). There was just enough of a diagnosis (corallites up to half an inch in diameter) to make the description legal under the ICZN rules for that era [13]. The first illustrations were published by Dun [4] who gave a more conventional description, so that until Talent [13] established the validity of the original publication it was Dun who was usually credited with the name (with spelling changed to *megastomum*).

Over the years since Dun's paper, a large number of specimens have been illustrated; for example from Victoria by Chapman [2 & 3], Talent [13 & 14], Withers [15] and Neil [7], and from New Zealand by Shirley [12]. The writer is guilty of adding to the number with a brief notice of some examples from Yea [5]. During the writing of that paper I had the pleasure of corresponding with the leading authority on *Pleurodictyum*-like ("pleurodictiform") corals, Yves Plusquellec of the University of Brest, France.

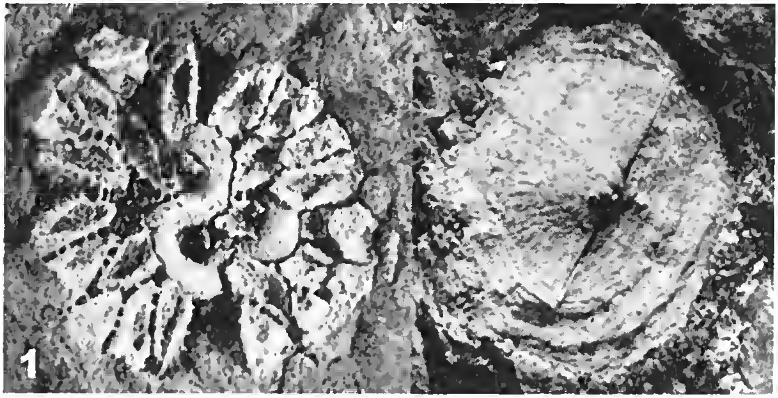
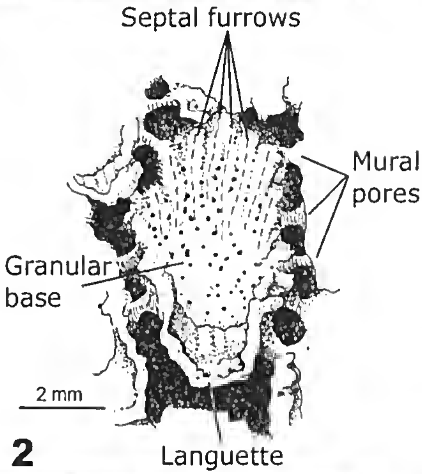


Fig. 1. Moulds of *Pleurodictyum problematicum* from the Massif Armoricain, distal face of base showing the corallites (left) and concentrically wrinkled proximal face of the base (right). Note the sinous tube of *Hicetes* on the distal face of the base. Plusquellec [8].

Fig. 2. Mould of a single corallite of *Ligulodictyum lingulatum* showing various morphological features (after Plusquellec unpublished drawing).

Fig. 3. Calcareous skeleton of *Ligulodictyum paraligulatum* showing the shallow corallites typical of most pleurodictiform corrals. Plusquellec [8].



Plusquellec, now retired but still in active research, has been studying pleurodictiform corals for over 40 years [8]. His published work thus far has been entirely confined to corals from Europe and North Africa. However, he has always kept Victorian specimens in mind and has examined material from Museum Victoria. In his one published comment, he has stated that figured examples of *Pleurodictyum megastoma* from Tabberabbera [13] and the South Island of New Zealand [12] actually belong to his genus *Ligulodictyum* [6]. This comment seems to have escaped palaeontologists in this part of the world as I have not seen reference to *Ligulodictyum* in the list published in the recent *Geology of Victoria* nor in other recent summaries of Australasian Tabulata.

Plusquellec is now preparing his doctoral thesis for publication. I do not know what is in the contents but a generic re-assignment of *P. megastoma* may be on the cards, and even some new coral species from Victoria. It is certainly the case that few Victorian specimens reach the size of McCoy's types from the Seville area of the Yarra Valley and, given the very wide age range of strata from which collections have been made [5], it is fairly obvious that more than one species is involved.

How can we more precisely identify these corals instead of lumping everything under *P. megastoma* ?

First, let us state what a pleurodictiform coral is (see Fig. 2 for some of the morphological terms):

- A tabulate coral, the corallites packed close together ("cerioid").
- Discoidal or moderately convex in shape.
- Outline of the corallum is close to circular.
- Limited number of corallites - from half a dozen to 3-4 dozen (not hundreds like other tabulates e.g. *Favosites*), so each corallite is relatively large.
- Each corallite is very shallow – from 2-5 mm (Fig. 3); these corals do not form thick masses.
- On the floor of each corallite there are scattered coarse granules, the impressions of which are easily seen on moulds.

The underside of the coral is concentrically wrinkled.

- The corallites are connected by large pores piercing the walls (mural pores), appearing as thick interconnecting spines on moulds.
- Attached to an old brachiopod shell, crinoid columnal or trilobite fragment rather than directly to a rock or other terrigenous substrate.

All of these characteristics are clearly visible even in the many Victorian specimens existing as moulds rather than preserved calcareous skeletons.

Here is the bad news: it would appear that many pleurodictiform corals are not closely related to *Pleurodictyum*. As with most corals, a correct diagnosis nearly always involves a study of the calcareous skeleton rather than the decalcified moulds which are usually all we have. For example, *Pleurodictyum* has a skeleton with a lamellar microstructure crossed by scattered denser elongated particles or trabeculae, whereas *Ligulodictyum* has a fibrous microstructure and probably belongs in a completely different family.

The following list of some pleurodictiform genera gives only those diagnostic details which are visible with moulds; for the microstructural details see the relevant papers by Plusquellec (unless noted otherwise [9]). Structures at the "initial angle" are important, this being the point (a corner if the corallites are angular) from which the corallite starts growing.

Pleurodictyum – Invariable presence of a commensal worm (*Hicetes*) appearing as a sinuous tube. Numerous mural pores. Corallites do not contain any calcareous structure at the bottom (i.e. additional to the basal wall). Septal furrows distinct.

Pterodictyum – Invariable presence of a commensal worm appearing as a sinuous tube (Fig. 1). Numerous mural pores. Septal furrows distinct. Outline lobate due to the bulging of the circular corallites.

Kerforneidictyum – Invariable presence of a commensal worm appearing as a sinuous tube. Corallum and individual corallites tall, distinctly conical in lateral profile, point of attachment is only the protocorallite (substrate is suspected to have been living seaweed), outline lobate. Mural pores present.

Cleistopora – Mural pores restricted to the distal regions of the corallites (hence may not be easily visible in moulds) or on some individuals of a population may be absent. Corallites with a spongy mass entirely filling the bottom. Septal furrows present.

Paracleistopora – No mural pores. Corallites with a spongy mass at the bottom, but only in the initial angle of each corallite (and maybe absent from the outer corallites), otherwise the bottom is granular. Septal furrows distinct.

Cleistodictyum – Few mural pores. Small number of corallites. Corallites with a spongy mass at the bottom only in the initial angle of the central corallites, otherwise the bottom covered in numerous fine granules. Septal furrows absent or weak.

Petridictyum [1] – About 7-9 corallites. Numerous mural pores. Septal furrows very distinct, and continue onto the distal face of the internal mould, which is heavily furrowed.

Procterodictyum [10] – Immediately recognizable as having two layers of corallites back-to-back, rather than a single layer backed by a wrinkled base. The arrangement means that the coral had no attachment point, and it is presumed therefore that it actually moved around the sea floor by contracting and expanding the polyps on the bottom layer of corallites (Fig. 4). It seems that it is one of several corals, living and fossil, that have some mobility [11]. Invariable presence of a commensal worm.

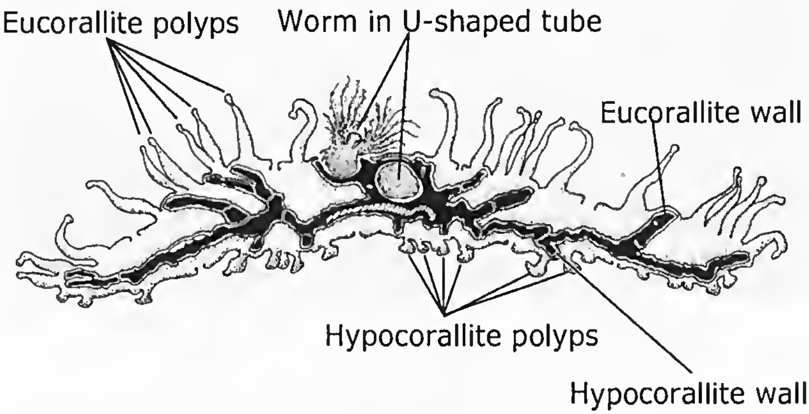


Fig.4. Reconstruction of the soft tissues of the mobile coral *Procterodictyum polentinensis*. Calcareous skeletonin solid bkack. After Plusquellec [10].

Ligulodictyum – Numerous mural pores. Septal furrows present. The initial angle of each corallite contains an excavation which in moulds shows as a raised tongue-like projection (Plusquellec: "languette", little tongue) which arcs around the perimeter of the bottom of the corallite to a greater or lesser extent; otherwise the bottoms are granular. The "languettes" are extremely prominent on one species in particular, *L. ligulatum*, even more so than on the type species *L. paraligulatum*.

Plusquellec has told me that he regards all the Early Devonian material he has seen from Victoria and New Zealand as *Ligulodictyum*, but that it is not all the same as McCoy's species, which he regards as fairly rare (as I noted above with regard to the size). I sent him a digital photo of a coral from the headwaters of Cable Creek, near Enoch's Point. As you can see from the photo reproduced here (Fig. 5), it is vaguely like *P. megastoma* but the corallites are rounder and more regular than one would expect (these are specific rather than generic characteristics of course). He replied that it was "typical *Ligulodictyum*", small languettes being visible on each corallite.

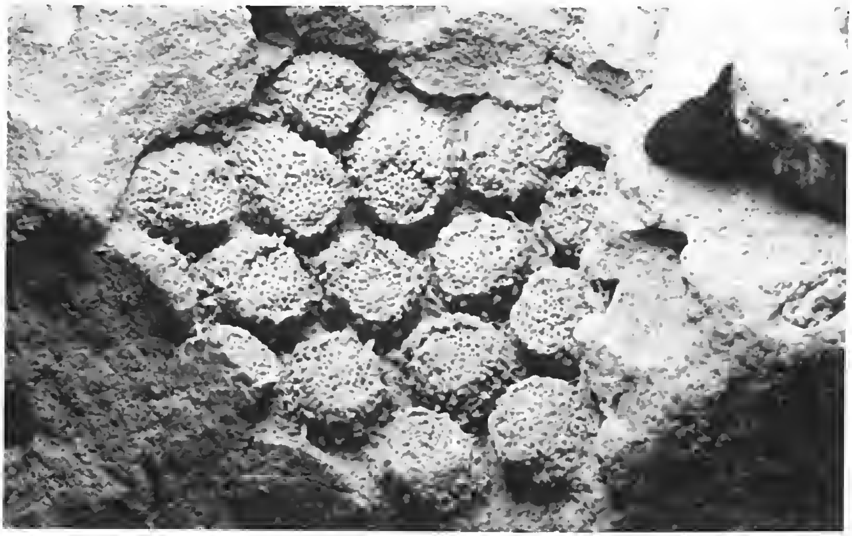


Fig.5. Mould of *Ligulodictyum* sp. from near Enoch's Point, Victoria

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BOOK AND JOURNAL REVIEWS

THE EVOLUTION REVOLUTION: Design without intelligence by Ken McNamara & John Long. Melbourne University Publishing Ltd, 2007 (Second edition, 304 pp.). Paperback AU$32.95. ISBN 0522853382.

> 3.8 million years ago life evolved.
> 540 million years ago came the first complex animals.
> 380 million years ago fish had evolved fins with arm bones. that humans have today.
> So are humans a case study for or against evolution?

The Evolution Revolution takes you on a rollocking ride through the past 3.8 million years of life on Earth, exploring the complex and often controversial issue of evolution. Join two of Australia's most accomplished popular science writers, palaeontologists Ken McNamara and John Long, on field trips that unearth some of the world's most significant fossils, from microbes to mighty mammals, including the feathered dinosaurs that make the link between reptiles and birds.

The authors take us through a dramatic transition from fins to limbs, how the first insects flew, why dinosaurs got so big and how life evolved into nearly every nook and cranny on Earth. The major fossil discoveries of the past decade they have documented comprehensively debunk the notion of intelligent design. Like it or not, along with the dinosaurs, donkeys and dahlias, we too came from bacteria that swam in the primordial soup.

Impeccably researched, remarkably readable, and punctuated with good humour, *The Evolution Revolution* puts a human face on the enterprise of palaeontology. It is essential reading for anyone interested in fossils and the big events in life history.

Information from Melbourne University Publishing Ltd.

FOSSIL INSECTS OF AUSTRALIA by Peter A. Jell. *Memoirs of the Queensland Museum* 50(1), 2004 (124 pp.). ISSN 0079-8835. Copies available from the Queensland Museum Shop, PO Box 3300, South Brisbane 4101. Phone: (07)38407729. Email: qmshop@qm.qld.gov.au

This taxonomic catalogue of the known fossil insects of Australia

provides illustrations of at least one species of every genus so far identified. Every known species is recorded with the age, rock unit (formation) and location (sedimentary basin). Some synonymies and updated taxonomic placements are included but this has not been an exhaustive review of taxonomy. The principal sources for fossil insects are described as the Upper Permian Boolaroo Formation in the Newcastle Coal Measures adjacent to Lake Macquarie, the Hawksbury Sandstone at Brookvale in Sydney, the Mt Crosby and Blackstone Formation in the Upper Triassic Ipswich Coal Measures of southeastern Queensland and the Lower Cretaceous Koonwarra Fossil bed in South Gippsland, Victoria. Other minor sites are discussed and potential for further research outlined.

Abstract of paper.

ANCIENT FORESTS: A Closer Look at Fossil Wood by Frank J. Daniels and Richard J. Dayvault with photography by Frank J. Daniels. Western Colorado Publishing Company, 2006 (456 pp.). Hardback, US$89.95 plus shipping and handling. ISBN 13: 978-0966293814. Available from Western Colorado Publishing Company (www.westerncoloradopublishing.com/BOOKS.html) or Amazon USA (www.amazon.com/books).

Perhaps the most intriguing, beautiful, and informative fossil wood book of all time, exploring the subject with images to illustrate each point – with Scanning Electron Microscope images, digital micro images, macro photographs, and medium format photographs.

Frank Daniels and geologist Dick Dayvault team up to explore the intricacies of fossil wood by leading the reader on an expedition into the micro world of fossil wood mineralization and cell structures. The book contains 1600 colour photographs, charts, and diagrams, including 438 fossil wood micro images, 40 Geologic Landscapes, and 46 thin section micrographs from modern conifers and hardwoods. Specimen photographs from worldwide locations (including Australia) contain examples of numerous woods, cones, ferns, cycads, and short shoots.

Major chapters address Fossil Wood Structure and Identification, The Process of Wood Transformation into Stone, Fossil Woods from the Western United States and around the World, and 3 Major Museum Collections of Fossil Woods.

Information from the publisher and Amazon.com

IN THE NEWS

DINOSAUR EGG RETURNED

A 72 million year old dinosaur egg has been handed back to Argentina after being seized in Australia in a fossil smuggling blitz.

The 8 kg egg, from the plant-eating Titanosaurus, was seized in Melbourne in 2005 on its way to the USA. Recently, the Australian Government returned the fossils to Argentina's ambassador in Canberra.

Assistant Minister for the Environment John Cobb said the seizures had a strong message to the world that Australia would not tolerate the illegal export of cultural heritage.

Report in the Herald Sun, Melbourne, August 7th, 2007.

EVIDENCE FOR BURROWING DINOSAURS

South-west Montana has yielded the first solid evidence that dinosaurs lived in burrows, and that adult dinosaurs continued to care for their young after hatching.

A fossil discovery in the mid-Cretaceous Blackleaf Formation has revealed skeletal remains of an adult and two juveniles of *Oryctodromeus cubicularis*, a new species found in the chamber of a sediment-filled burrow. Anatomical digging features and dimensions show that *Oryctodromeus* was the burrow maker and the association of adult and young within the burrow provides evidence of continuing parental care in a dinosaur.

David Varricchio of Montana State University and colleagues analysed bones found inside a twisting deposit of sandstone which passed through three layers of rock on an old river plain. Varracchio says the sandstone formed 95 million years ago when sand washed into a burrow which was two metres long by 30cm wide by 40cm high. This burrow formed a tight fit around the dinosaur, a feature which provided protection against predators squeezing in.

These burrow-dwelling dinosaurs are a previously unknown species of two-legged plant eaters related to the larger duck-billed dinosaurs. The adult was about 2.1 metres long – half of which length was tail – and

probably weighed 22-32 kg. The two juveniles were about half this length.
http://www.newscientist.com/article/dn11419?DCMP=NLC-nletter&nsref=dn11419

GIGANTORAPTOR RE-WRITES BIRD EVOLUTION THEORIES

A new non-avian dinosaur find by renowned Chinese fossil hunter, Dr Xing Xu, is causing scientists to re-evaluate the evolution of birds. The UK science journal *Nature* reports that the partial skeleton of a young adult dinosaur, *Gigantoraptor erlianensis* dating from the Late Cretaceous, was found in the inner Mongolian Gobi Desert. What was different about this particular dinosaur was that the fossils indicate a weight of around 1400 kg, very much heavier than the 40 kg feathered and beaked oviraptor family with which it is grouped.

Gigantoraptor was toothless with a 25cm beak and some feathering, and had lightweight tail and arm bones. It was believed to have been fast-growing and there are signs that this specimen was about 11 years old. The likely life-span of these dinosaurs is thought to have been around 18 years. Its long, slender lower legs may have made it the fastest runner among two-legged dinosaurs.

This find has shown that there was a much greater diversity among dinosaurs than had previously been thought. It has also thrown doubt on current theories that as dinosaurs became more birdlike, they became smaller. Gigantoraptor was two-thirds the size of a Tyrannosaurus, compared with the turkey-sized members of the oviraptor group, and its anatomy was more birdlike than would have been expected in a dinosaur this size, Dr Xu said.
http://www.nature/journal/v447/n7146/abs/nature05849.html

HERDSMAN FINDS WELL PRSERVED MAMMOTH

In the permafrost of north-west Siberia, a reindeer herdsman has discovered the carcase of a baby mammoth, which deputy director Alexei Tikhonov, of the Zoological Institute of the Russian Academy of Sciences, says could be the best preserved specimen of its type ever found. He says the mammoth had no defects except that its tail was missing, and in terms of its state of preservation, was one of the world's most valuable discoveries. The frozen carcass is being sent to Japan for detailed study.

Mammoths are an extinct member of the elephant family. Adults often possessed long curved tusks and a coat of long hair. This latest 130cm tall, 50kg Siberian specimen was six months old and is thought to have died 10,000 years ago, at the end of the last Ice Age, when the great beasts were vanishing from the planet. Its trunk and eyes are still intact and some of its fur remains on the body. An international delegation of experts recently carried out a preliminary examination of the animal. Larry Agenbroad, director of the Mammoth Site of Hot Springs Research Centre in South Dakota, USA, said it was extremely rare to find a juvenile mammoth in any condition. He knew of only three other examples.

Some scientists hold out hope that well preserved sperm or other cells containing viable DNA could be used to resurrect the mammoth lineage. And despite the inherent difficulties, Dr Agenbroad remains optimistic about the potential for cloning.

Bringing mammoths back from the dead could take the form of injecting sperm into the egg of a relative, such as the Asian elephant, to try to create a hybrid. Alternatively, scientists could attempt to clone a pure mammoth by fusing the nucleus of a mammoth cell with an elephant egg cell stripped of its DNA.
http://news.bbc.co.uk/2/hi/science/nature/6284214.stm

AGENTS SEIZE SMUGGLED DINOSAUR EGGS

Customs agents in the United States have seized 22 fossilised dinosaur eggs which are believed to have been smuggled in from China. The eggs had been auctioned for $420,000 by Los Angeles auction house Bonhams & Butterfields.

The 65-million-year-old eggs were so well preserved that embryonic raptors were visible inside most of them. Auction house spokesman Levi Morgan said the sale, to an undisclosed buyer, was cancelled after concerns were raised about the legality of the export from China.

Customs agents said the eggs had been discovered in Guangdong Province in 1984 and had found their way to an American collector via Taiwan 20 years later. The Taiwan shipper was unable to provide paperwork showing the legality of the transfer from China, and had wrongly stated the value of the fossil eggs at $500.

Bonhams & Butterfields said the auction house was not able to verify export documentation and had to trust that the American seller could legally consign the eggs for sale. The auction house is assisting with the investigation but, at the time of this report, no arrests had been made.
Information from Fox News: www.foxnews.com/story/0,2933,252779,00.html